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REMARKS

This paper is responsive to a Final Office Action mailed March 1, 2007. Prior to this response, claims 1-21, 23, and 25-44 were pending. After amending claims 1-2, 10-11, 19-21, 23, and 39, claims 1-21, 23, and 25-44 remain pending.

In Section 2 of the Office Action claims 1-21, 23, and 25-44 have been rejected under 35 U.S.C. 112, second paragraph, as being indefinite. The Office Action states that the phrase "exposed to a series of 2-shot laser annealing steps in orthogonal directions" is vague.

With respect to claim 1, the Office Action states that it is not clear if the orthogonality refers to steps, or the shots with the steps.

Claim 1 has been amended again for clarity.

With respect to claim 2, the Office Action states that the term "two steps" is ambiguous. In response, claim has been amended for clarity.

The Office Action also states that the recitation of "repeating a sequence of two-shot orthogonal laser irradiations N number of times" is unclear. In response, the claim 2 has been amended for greater clarity.

With respect to claim 10, the Office Action states that the phrase "odd and even iteration" is unclear, due to amendments made in the previous Office Action response. Claim 10 has been amended for consistency and clarity.

With respect to claim 11, the Office Action states that it is not clear if "a second area with a top surface" is a new limitation. In response, the phrase has been deleted from the claim.

With respect to claim 14, the Office Action states that the term "between" grain boundaries excludes co-locating a side on one of the grain boundaries. In response, the Applicant respectfully submits that the conventional dictionary definition of the term "between" does not exclude the possibility of a shared side. Further, it is a well established principle of Patent law that an Applicant is permitted to be their own lexicographer. On page 10 of the specification, lines 19-20, it states that, "(b)y located between, we mean that the sides can be co-located on one or both of the GBs." Note, GB stands for grain boundary.

With respect to claims 19-21 and 23 the Examiner is correct. Claim 19 should depend from claim 11, not claim 3. Claims 19 and 20 have been amended accordingly.

With respect to claim 25, the Office Action states that it is not clear how the "annealing" limitation relates to the limitation of the first area being annealed via directional solidification (DS). In response, the Applicant notes that claim 25 recites additional details of the 2N-shot laser annealing process. Specifically, claim 25 states that the 2N-shot process can be enabled using 2 laser beams, whose summed energy is sufficient to anneal the first area. Claim 25 does not address or modify the separate step of the DS annealing process initially presented in claim 1. Since claim 25 does not make an association between the 2N-shot annealing and the DS process annealing, there is no basis for assuming that the 2N-shot and DS processes recite a common annealing step.

The same analysis applies to claims 28, 32, and 35. Claims 28, 32, and 35 all describe additional details of the 2N-shot process that culminate with annealing, but have nothing to do with the DS process, or any annealing that may occur as a result of the DS process.

With respect to claim 39, the Office Action states that “the film overlying the diffusion barrier” is inconsistent with any previously introduced film. As suggested in the Office Action, lines 6 and 7 have been deleted. Claim 39 has also been amended to remove any ambiguity between the “channel region” and the “transistor channel”.

In Section 3 of the Office Action claims 1-21, 23, and 25-44 have been rejected under 35 U.S.C. 112, first paragraph, as containing subject matter not described in the specification. In response, the Applicant notes that support for the modifications made to claims 1 and 2 can be found in the specification at page 6, lines 13-17, and at page 8, lines 1-15.

At page 6, the specification states, “(i)n the 2N-shot method, an amorphous silicon (a-Si) film is exposed to a series of 2-shot laser irradiation steps with ‘N’ equal to the number of steps. For each step, the substrate (or beamlets) is rotated 90° with respect to the direction of lateral growth of the previous step.”

At page 8, the specification states the following:

Fig. 6 is a plan view of the present invention silicon film with quasi-single crystal silicon in a selected region. An a-Si film 602 includes a grid region 603 of polycrystalline silicon. The region 603 has a plurality 604 of parallel grain boundaries (GBs) oriented in a first direction 606 and plurality 608 of parallel GBs oriented in a second direction 609. In general, consecutive first direction GBs 604 are equally spaced and consecutive second direction GBs 608 are equally spaced. However, other spacing configurations are possible. First direction GBs 604 and second direction GBs 608 form a grid 610 of GBs. The grid 610, in turn, forms cells, such as cell 611. First direction GBs 604 and second direction GBs 608 are formed by a series of 2N-shot laser

irradiation sequences performed on the amorphous silicon film 602. Typically, the 2N-shot process results in the first direction GBs 604 and second direction GBs 608 being orthogonally oriented as shown in Fig. 6.

Claim 1, as amended, recites, "using a 2N-shot laser irradiation process to form polycrystalline silicon in a first area of the film, where the film is exposed to a series of 2-shot laser irradiation steps, where each series includes N number of steps of lateral growth in a first direction and N number of steps of lateral growth in an orthogonal directions;" The Applicant respectfully submits that the above-quoted limitation of claim 1 is described in the specification in a manner sufficient to enable a person of skill in the art to enable the invention, as required by the first paragraph of 35 U.S.C. 112.

Claim 2, as amended, recites, "wherein exposing the film to a series of 2-shot laser irradiation steps includes:

in each series, projecting a first laser beam through an aperture pattern oriented in a first direction N number of irradiations; and,

subsequent to the N number of irradiations in the first direction, projecting the first laser beam through an aperture pattern oriented in a second direction, orthogonal to the first direction, N number of irradiations." Again, the Applicant submits that the above-quoted limitation of claim 2 is described in the specification in a manner sufficient to enable a person of skill in the art to enable the invention, as required by the first paragraph of 35 U.S.C. 112.

In Section 6 of the Office Action, claim 1 has been provisionally rejected on the grounds of non-statutory obviousness-type

double patenting with respect to claims 1 and 7 of US 6,818, 484. In response, the Applicant notes that a Terminal Disclaimer has already been filed for this patent. US 6,818,484 is listed as the 5th item in the previously submitted Terminal Disclaimer.

In Section 7 of the Office Action, claims 1-10 has been rejected under 35 U.S.C. 103(a) as unpatentable with respect to Sposili et al. ("Sposili"; US 6,577, 380), citing Section 24 of the Office Action mailed on 9/19/2006. The Office Action states that Sposili describes a sequential lateral solidification (SLS) process, which includes both laser irradiation and directional solidification. This rejection is traversed as follows.

An invention is unpatentable if the differences between it and the prior art would have been obvious at the time of the invention. As stated in MPEP § 2143, there are three requirements to establish a *prima facie* case of obviousness.

First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. *In re Vaeck* 947 F.2d 488, 20 USPQ2d, 1438 (Fed. Cir. 1991).

In the Abstract, Sposili discloses a material processing system that may employ a SLS process. At col. 1, ln. 20-25, Sposili discloses an optical material processing system. At col. 2, ln. 1-40, Sposili states that, "SLS requires that with each irradiation the silicon film be

completely melted in and only in a micron-sized spatially controlled region or regions, and that the film be translated with sub-micron precision in between irradiations such that the lateral crystallization induced by each irradiation overlaps with that produced previously.” The Applicant notes that Sposili does not disclose *orthogonal* film transitions, as is required in the claimed 2N-shot process.

At col. 3, ln. 46 through col. 4, ln. 5, and col. 5, ln. 8-25 & 25-66, Sposili discloses an optical system that is able to deliver localized intense heat. The cited section also discloses a large-travel translation system, a self-luminous light beam, and an energy recycling exposure system. The cited section claims an increased lateral growth length and reduced number of defects as a benefit of adjusting pulse duration.

At col. 6, ln 15-60, Sposili discloses an XeCl laser. At col. 7, ln. 11-22, Sposili discloses a self-luminous beam and mask. At col. 9, ln. 34-60, Sposili discloses a system that uses a beam 11 and mask 8 to perform the SLS process. “In addition to the delivery of the beam energy at sufficient fluence in the patterns and at the locations defined by the mask, an important element of the system is the ability to translate the substrate (and/or the mask) in a specific schedule of scanning and stepping precisely coordinated with the laser pulses. The details of the translation schedule are specific to the particular process being conducted and will not be elaborated upon here.”

At col. 10, ln. 10-20, Sposili discloses a mask with a chevron aperture.

The claims appear to have been rejected based upon the assumption that Sposili discloses all the limitations recited in Applicant’s claim 1. However, as shown above, none of the cited sections of Sposili

disclose a "2N-shot laser irradiation process to form polycrystalline silicon in a first area of the film, where the film is exposed to a series of 2-shot laser irradiation steps, where each series includes N number of steps of lateral growth in a first direction and N number of steps of lateral growth in an orthogonal direction", as recited in claim 1. In fact, Sposili never mentions the term "orthogonal", "perpendicular", or "normal". Without the use of these terms it is impossible to describe the Applicant's 2N-shot process. With respect to the third *prima facie* requirement, Sposili does not explicitly disclose the 2N-shot process recited in claim 1. Claims 2-10, dependent from claim 1, enjoy the same advantages.

With respect to the first *prima facie* requirement, the Office Action has provided no evidence that an expert in the art would be motivated to modify Sposili in such a way as to make the 2N-shot process obvious. As explained above in response to the third *prima facie* requirement, Sposili fails to disclose all of the claimed invention limitations. To meet the first *prima facie* requirement, there must be an explicit teaching in the Sposili reference that shows an expert how the modifications can be made to yield the claimed invention. Such a *prima facie* case has not been made, simply because all the Applicant's claim limitations cannot be found in the Sposili reference.

Alternately, if the Examiner is relying upon the knowledge of a person with skill in the art to supply motivation lacking the Sposili reference, then additional evidence must be provided. Notable, when the source or motivation is not from the prior art references, "the evidence" of motive will likely consist of an explanation or a well-known principle or problem-solving strategy to be applied". *DyStar*, 464 F.3d at 1366, 80 USPQ2d at 1649. The Examiner has not supplied any explanation of how

an expert could possibly modify Sposili to yield all the explicit limitations recited in the base claims.

Considered from the perspective of the second *prima facie* requirement, even if an expert were given the Sposili invention as a foundation, no evidence has been provided to show that there is a reasonable expectation of success in the claimed invention.

In summary, the Applicant respectfully submits that a *prima facie* case of obviousness has not been supported, and the Applicant requests that the rejection of claims 1-10 be removed.

The Office Action has rejected claims 11-21, 23, and 25-44 under 35 U.S.C. 103(a) as unpatentable with respect to Sposili in view of Yamazaki, and Fukunaga or Kawasaki. The Office Action acknowledges that Sposili does not disclose the use of a third aperture pattern. The Office Action states that it would have been obvious to employ sequential annealing techniques as taught by Sposili, for any laser annealing technique presented in the combination of Yamazaki plus Fukunaga or Kawasaki. This rejection is traversed as follows.

The Yamazaki/Fukunaga/Kawasaki references have been combined with Sposili based upon the assumption that Sposili discloses all the limitations recited in Applicant's claim 1. However, as shown above, in response to the rejection of claims 1-10 (as obvious in light of Sposili), Sposili does not disclose a "2N-shot laser irradiation process to form polycrystalline silicon in a first area of the film, where each series includes N number of steps of lateral growth in a first direction and N number of steps of lateral growth in an orthogonal direction", as recited in claim 1. With respect to the third *prima facie* requirement, even if

elements from Yamazaki/Fukunaga/Kawasaki are combined with Sposili, that combination does not explicitly disclose the 2N-shot process recited in claim 1. Claims 11-21, 23, and 25-44, dependent from claim 1, enjoy the same advantages.

With respect to the first *prima facie* requirement, the Office Action states that it would have been obvious to employ sequential annealing techniques as taught by Sposili, for any laser annealing technique presented in the combination of Yamazaki plus Fukunaga or Kawasaki. However, even if this statement were correct, it does not explain how an expert in the art could have modified the Sposili reference in such a way as to describe all the claimed invention limitations. As explained above in response to the third *prima facie* requirement, even when combined, the four references fail to disclose all of the 2N-shot process. The above-quoted statement from Office Action does not explain how even a person with skill in the art could modify Sposili's SLS process, in light of the Yamazaki/Fukunaga/Kawasaki annealing processes, to yield the limitations of the claimed invention. Alternately stated, the motivation to combine these references cannot be built upon a mere desire to swap annealing processes. Rather, to meet the first *prima facie* requirement, there must be an explicit teaching in the Yamazaki/Fukunaga/Kawasaki references that shows an expert how the Sposili reference can be modified to yield a 2N-shot process. Such a *prima facie* case has not been made, simply because all the Applicant's claim limitations cannot be found in the four references.

Alternately, if the Examiner is relying upon the knowledge of a person with skill in the art to supply motivation lacking the Sposili reference, then additional evidence must be provided. The Examiner has

not supplied any explanation of how an expert could possible modify Sposili to yield all the explicit limitations recited in the base claims.


Considered from the perspective of the second *prima facie* requirement, even if an expert were given the Sposili/Yamazaki/Fukunaga/Kawasaki inventions as a foundation, no evidence has been provided to show that there is a reasonable expectation of success in the claimed invention.

In summary, the Applicant respectfully submits that a *prima facie* case of obvious has not been supported, and the Applicant requests that the rejection of claims 11-21, 23, and 25-44 be removed.

It is believed that the application is in condition for allowance and reconsideration is earnestly solicited.

Respectfully submitted,

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